Revolutionize Propulsion Test Facility High-Speed Video Imaging with Disruptive Computational Photography Enabling Technology

Completed Technology Project (2014 - 2015)

Project Introduction

Advanced rocket propulsion testing requires high-speed video recording that can capture essential information for NASA during rocket engine flight certification ground testing. While it is important to assess all anomalies during testing, this is particularly true in the event of a mishap. The video recording in use today at NASA's Stennis Space Center (SSC) is significantly outdated and in need of the revolutionary approach being proposed. The current system has poor resolution and records to VHS tapes that are no longer commercially available. The system has been partially upgraded by incorporating consumer grade digital cameras, but these cameras have significant limitations including plume saturation and on-board memory storage, which make it nearly impossible, in catastrophic situations that result in the loss of a camera, to obtain critical information. This project will design and build a state-of-the-art high-speed video recording system using disruptive technologies based on emerging advances made in the field of computational photography. This system will not only provide quality, high-speed, 3-D high dynamic range video to the SSC engine test complex, but the technologies developed will be extendable to other NASA priorities including launch monitoring and space-based rover and robotics missions.

This project will design and build a novel state-of-the-art high-speed video recording system to provide 3-D High Dynamic Range (HDR) video imagery for operational use on the SSC engine test stands. The system will leverage newly emerging algorithms being developed within the computational photography discipline. Computational photography expands digital photography by applying computational image capture, processing, and manipulation techniques to improve image quality. HDR imaging effectively increases a camera's dynamic range and eliminates saturation. Juxtaposed with current imaging techniques, which often utilize either multiple cameras or a single camera with multiple exposure sequencing, the transformative approach will be implemented at the chip level using a single camera, which significantly reduces cost and implementation complexities. Three such cameras will provide multiple viewing, enabling high-speed 3-D HDR imagery, important for a more robust analysis.

Anticipated Benefits

The technologies developed are extendable to other NASA high dynamic range imaging needs, including launch monitoring and space-based rover and robotics missions

NASA's use of HDR imaging in rover and spacecraft robotic applications will be expanded. Remote sensing and mobile mapping applications, aerial and satellite imagery will be improved and new applications will be developed from this technology.

Technology Transfer Program Logo

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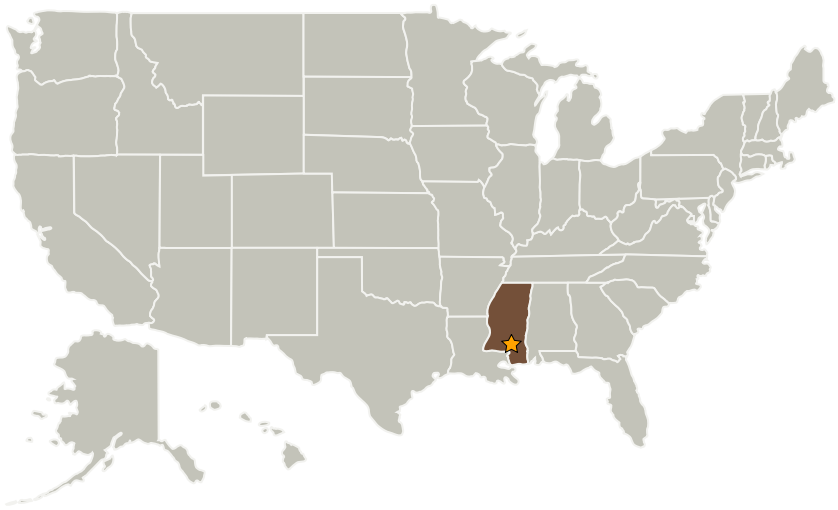
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Stennis Space Center(SSC)	Lead Organization	NASA Center	Stennis Space Center, Mississippi

Co-Funding Partners	Type	Location
Innovative Imaging and Research Corporation	Industry Women-Owned Small Business (WOSB)	Stennis Space Center, Mississippi

Primary U.S. Work Locations
Mississippi

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Stennis Space Center (SSC)

Responsible Program:

Center Independent Research & Development: SSC IRAD

Project Management

Program Manager:

Ramona E Travis

Project Manager:

Howard J Conyers

Principal Investigator:

Robert E Ryan

Co-Investigator:

Mary A Pagnutti

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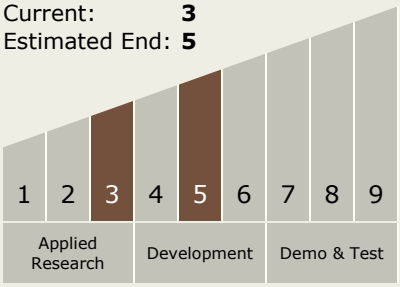
Images

Revolutionize Propulsion Test Facility High-Speed Video Imaging with Disruptive Computational Photography Enabling Technology
Technology Transfer Program Logo
(https://techport.nasa.gov/image/16545)

Technology Maturity (TRL)

Start: **3**
Current: **3**
Estimated End: **5**



Technology Areas

Primary:

- TX13 Ground, Test, and Surface Systems
  - TX13.2 Test and Qualification
    - TX13.2.4 Verification and Validation of Ground, Test, and Surface Systems

Target Destination

Earth